



PROGRESS IN NEUROSCIENCE PINS

Seminar Series of the
Brain & Mind Research Institute
Weill Cornell Medical College (WCMC)
&

The Graduate Program in Neuroscience of
WCMC and Sloan Kettering Institute

Thursday, 3/16/17, 4 PM, coffee at 3:45 PM

Weill Auditorium



“Neural circuits for visual processing in thalamus”

Judith A. Hirsch, PhD, Professor of Biological Sciences, University of
Southern California

Abstract



The thalamus is often viewed as a gatekeeper, relaying sensory signals to the cortex during waking and halting their flow during sleep. While true, this is an impoverished description. Our work explores how thalamic circuits contribute to sensory processing *per se*. We focus on the lateral geniculate nucleus, which conveys information from the eye downstream. Relay cells in the geniculate make few connections with each other but are embedded in two dense inhibitory networks. First, local Interneurons supply feedforward inhibition; second, neurons in the visual sector of thalamic reticular nucleus (a thin sheet of gabaergic cells that cloak the thalamus) provide feedback inhibition. The initial part of the presentation explores how retinogeniculate divergence and convergence, coupled with feedforward inhibition, might facilitate signal detection and enhance perceptual acuity. The later part explores the role of the reticular nucleus, from the perspectives of feature detection and spatial attention.

Recent Relevant Publications:

1. Martinez, LM, Molano-Mazon, M, Wang, X, Vaingankar, V. Sommer, FT and **Hirsch**, JA (2014) Statistical wiring of thalamic receptive fields optimizes spatial sampling of the retinal image, *Neuron* **81**: 943-956.
2. **Hirsch**, JA, Martinez, LM, Wang, X, Sommer FT (2015) How Inhibitory Circuits in the Thalamus Serve Vision, *Ann. Rev. Neurosci.* **38**: 309-329
3. Suresh, V, Çiftçioğlu, U, Wang, X, Lala, BM, Ding, KR, Smith, WE, Sommer, FT and **Hirsch**, JA (2016) Synaptic contributions to receptive field structure and response properties in the rodent lateral geniculate nucleus of the thalamus, *J. Neurosci.* **36**: 10949-10963.



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